DETAILED ACTION

Election/Restrictions

1.   Restriction is required under 35 U.S.C. 121 and 372.

       This application contains the following inventions or groups of inventions which are not

so linked as to form a single general inventive concept under PCT Rule 13.1.

       In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a

single invention to which the claims must be restricted.

Group 1, claims 38-41,45-48,50-57,61-64,66-69, are drawn to determining image quality based
on the combination of three different quality measures.

Group 2, claims 42 and 58, are drawn to determining a blockiness invisibility measure of an
image.

Group 3, claims 43 and 59, are drawn to determining a colour richness measure of an image.

Group 4, claims 44 and 60, are drawn to determining a sharpness measure of an image.

Group 5, claims 49 and 65, are drawn to determining a motion activity measure of an image.

       Upon the allowance of a generic claim, applicant will be entitled to consideration of

claims to additional species which are written in dependent form or otherwise require all the

limitations of an allowed generic claim. Currently, the following claim(s) are generic: 38, 48,

and 54.

2.   REQUIREMENT FOR UNITY OF INVENTION

       As provided in 37 CFR 1.475(a), a national stage application shall relate to one invention

only or to a group of inventions so linked as to form a single general inventive concept

("requirement of unity of invention"). Where a group of inventions is claimed in a national stage

application, the requirement of unity of invention shall be fulfilled only when there is a technical

relationship among those inventions involving one or more of the same or corresponding special

technical features. The expression "special technical features" shall mean those technical features

that define a contribution which each of the claimed inventions, considered as a whole, makes

over the prior art.

      The determination whether a group of inventions is so linked as to form a single general

inventive concept shall be made without regard to whether the inventions are claimed in separate

claims or as alternatives within a single claim. See 37 CFR 1.475(e).

3.   During a telephone conversation with Stephen Bent on Monday January 24th 2011 a

provisional election was made without traverse to prosecute the invention of group 1, claims 38-

41,45-48,50-57,61-64,66-69. Affirmation of this election must be made by applicant in replying

to this Office action. Claims 42-44, 49, 58-60, 65, and 70-71 are withdrawn from further

consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

EXAMINER'S AMENDMENT

4.   An examiner's amendment to the record appears below. Should the changes and/or

additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR

1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the

payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with

Stephen Bent on 01/24/2011.

The application has been amended as follows:

- Instant claim 70 has been cancelled.

- Instant claim 61 has been amended to depend from claim 54 instead of claim 17.

Claim Objections

5.   Claim 53 is objected to because of the following informalities: Claim 53 in line 1 of the

claim refers to "the determination", but there are several determining steps in claim 38 to which

it refers. In the interest of furthering the prosecution of the instant application, the examiner will

consider "the determination" to refer to all the determining steps. Appropriate correction is

required.

Claim Rejections - 35 USC § 102

6.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or
> on sale in this country, more than one year prior to the date of application for patent in the United States.

7.   Claims 38, 48, 51-54, 64, and 67-69 are rejected under 35 U.S.C. 102(b) as being

anticipated by Van Zon (US 2002/0090134).

Instant claim 38: Apparatus [Figure 1 and paragraphs 0034-0035 describe the system and the

means for performing the disclosed method.] for determining a measure of image quality of an

image, comprising:

      means for determining a blockiness invisibility measure of the image; [Paragraph 0060 –

measurement of metric for blockiness.]

      means for determining a colour richness measure of the image; [Paragraph 0038 -

measurement of color and saturation.]

      means for determining a sharpness measure of the image; and [Paragraph 0038 –

measurement of sharpness and motion (motion is an indicative of blurring which correlates to

image sharpness).]

      means for providing the measure of image quality of the image based on respective

products of the blockiness invisibility measure, the colour richness measure and the sharpness

measure of the image with respective attenuation factors. [Paragraphs 0029-0033 and 0038-

0045 have taught the measurement and summation of various image quality metrics (sharpness,

color, noise, blockiness, motion, and other known image characteristics) to create an overall

image quality value based on the weighted summation of the various image metrics.]

Instant claim 48: Apparatus for determining a measure of image quality of an image within a

sequence of two or more images, comprising:

      apparatus according to claim 38; and [As per the discussion of claim 38, the limitations of

claim 38 have been taught by the cited prior art.]

means for determining a motion activity measure of the image within the sequence of images. [Paragraph 0038 of Van Zon has taught motion which implies activity.]

Instant claim 51: Apparatus according to claim 48, wherein the means for providing the measure of image quality of the image is operable to provide the image quality measure further based on the motion activity measure of the image. [As per the discussion of claim 38, the limitations of claim 38 have been taught by the cited prior art (summation of image quality metrics includes motion).]

Instant claim 52: Apparatus for determining a measure of video quality of a sequence of two or more images, comprising:

apparatus according to claim 38; and [As per the discussion of claim 38, the limitations of claim 38 have been taught by the cited prior art.]

means for providing the measure of video quality based on an average of the image quality for a plurality of images within the sequence of two or more images. [As per the above discussion the image quality metrics are determined by a weighted average for each of a plurality of images within the video.]

Instant claim 53: Apparatus according to claim 38, operable to make the determination without reference to a reference image. [As per the discussion of claim 38, the limitations of claim 53 have been taught by the cited prior art. Furthermore, at least some of the metrics of the image

data taught by Van Zon do not include comparison of the image being analyzed to a reference

image.]

Instant claims 54, 64, and 67-69: Claims 54, 64, and 67-69 have described the method

performed by the apparatus of claims 38, 48, and 51-53. As per the discussion of claims 38, 48,

and 51-53 the apparatus and the method it performs have been disclosed by the cited prior art.

Claim Rejections - 35 USC § 103

8.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

9.   Claims 39, 45-46, and 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Van Zon as applied to claim 38 above, and further in view of Hsieh et al ("On the Entropy

Analysis of Grayscale Images").

Instant claim 39: Apparatus according to claim 38, wherein the means for determining the

colour richness measure of the image is operable to provide the colour richness based on the sum

of respective products of the probabilities of colour values and the logarithms, using e as a base,

of those probabilities. [Van Zon has taught the measurement of image quality metrics and the

combination of these metrics to assign an overall quality measure to the image data, but has not

detailed the methods of measuring the various metrics (such as colour richness). However,

various prior art documents have taught the measurement of the various metrics used by Van

Zon to determine the quality of an image. Hsieh has taught (page 3) an image entropy

(determines amount of variation or depth of information associated with a particular source,

wherein the source is the grayscale color value) method of measuring colour (grayscale is a

color) entropy using a summation of probabilities of the color values using e as a base of those

probabilities. Thus both Van Zon have taught the determination of at least one image quality

metric related to the color of an image (additionally, color richness is identified by the teachings

of Hsieh as an image quality metric). It would have been obvious to one of ordinary skill in the

art to substitute a known method of measuring an image quality metric such as color richness as

taught by Hsieh into the method of measuring and combining multiple image quality metrics as

taught by Van Zon to perform the predictable result of measuring image quality using image

characteristics (such as color richness) known to one of ordinary skill in the art to be indicative

of image quality.]

Instant claims 45-46 and 55: The limitations of claims 45-46 have been taught as per the above

discussion of claims 38-39. Furthermore, claim 45 further requires that the "blockiness

invisibility measure of the image comprises an apparatus for determining a colour richness

measure". However, since the system of Van Zon is a computing device the means for

determination of the image metrics are jointly performed by the same apparatus and thus the

measurement device for each metric comprises the measurement device for each of the other

metrics. Claim 55 has described the method performed by the apparatus of claims 38-39. As per

the discussion of claim 38-39 the apparatus and the method it performs have been disclosed by

the cited prior art.

10.   Claims 40-41, 47, 56-57, and 63 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Van Zon as applied to claim 38 above, and further in view of Krotkov

("Focusing").

Instant claim 40: Apparatus according to claim 38, wherein the means for determining the

sharpness measure of the image is operable to provide the sharpness based on the sum of

respective products of the probabilities of differences in a plurality of colour channel values

between neighbouring portions of the image and the logarithms of those probabilities. [Van Zon

has taught the measurement of image quality metrics and the combination of these metrics to

assign an overall quality measure to the image data, but has not detailed the methods of

measuring the various metrics (such as sharpness). However, various prior art documents have

taught the measurement of the various metrics used by Van Zon to determine the quality of an

image. Krotkov has taught several methods of analyzing image sharpness (focus - page 227

section 3) using image entropy of local variations (histogram of local variances - section 3.6),

wherein the summation of probabilities of local variances (plurality of differences between

neighboring image values) in a color channel (grayscale) is taught to determine the sharpness

level (focus) of the grayscale (color) image entropy using a summation of probabilities of the

color values using e as a base of those probabilities. Thus both Van Zon and Krotkov have

taught the determination of at least one image quality metric related to the sharpness of an

image. It would have been obvious to one of ordinary skill in the art to substitute a known

method of measuring an image quality metric such as sharpness as taught by Krotkov into the

method of measuring and combining multiple image quality metrics (including sharpness) as

taught by Van Zon to perform the predictable result of measuring image quality (as taught by

Van Zon) using a plurality of image characteristics (such as sharpness) known to one of

ordinary skill in the art to be indicative of image quality.]

Instant claim 41: Apparatus according to claim 40, wherein the differences between

neighbouring portions of the image are differences in image data between neighbouring pixels.

[See above, wherein the variances are local.]

Instant claim 47: As per the discussion of claims 38 and 40-41 the limitations of claim 47 have

been taught by the cited prior art.

Instant claims 56-57 and 63: Claims 56-57 and 63 have described the method performed by the

apparatus of claims 38 and 40-41. As per the discussion of claims 38 and 40-41 the apparatus

and the method it performs have been disclosed by the cited prior art.

11.   Claims 50 and 66 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van

Zon as applied to claims 38 and 48 above, and further in view of Cernekova et al ("Entropy

Metrics used for Video Summarization").

Instant claim 50: Apparatus according to claim 48, wherein the means for determining a motion

activity measure of the image within the sequence of images comprises an apparatus for

determining a motion activity measure of an image within a sequence of two or more images,

comprising: [As per the discussion of claims 38 and 48, Van Zon has taught the determination of

various image quality metrics of a sequence of image data (video images) including motion of

the image in order to determine an overall measure of the image quality, but Van Zon has not

specified the methods of determining the motion measurement. However, Cernekova has taught

a joint entropy based method of analyzing image motion activity for used in other applications

(determining the status of the video images), but has taught that the use of entropy measurements

between pixels of consecutive frames as a method for measuring the amount of motion activity in

an image (see sections 2 and 3 of Cernekova). Cernekova has further taught other applications

and uses of this metric than those taught by Van Zon, but Cernekova is only being relied upon to

teach the measurement of the amount of image motion using an entropy method (see section 3).

Thus both Van Zon and Cernekova have taught the determination of at least one image quality

metric related to the sharpness of an image. It would have been obvious to one of ordinary skill

in the art to substitute a known method of measuring an image quality metric such as motion

activity as taught by Krotkov into the method of measuring and combining multiple image quality

metrics (including sharpness) as taught by Van Zon to perform the predictable result of

measuring image quality (as taught by Van Zon) using a plurality of image characteristics (such

as motion) known to one of ordinary skill in the art to be indicative of image quality since

greater motion correlates to reduced image sharpness.]

means for determining differences in a plurality of colour values between pixels within the image and corresponding pixels in a preceding image within the sequence of images; [Inherent to the entropy method defined by Cernekova in section 3.]

means for determining respective probabilities of individual colour value differences between the image and the preceding image; [Inherent to the entropy method defined by Cernekova in section 3.]

means for determining respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences; and [Inherent to the entropy method defined by Cernekova in section 3.]

means for providing the motion activity measure based on the sum of the respective products of the probabilities of individual colour value differences and the logarithms of the probabilities of individual colour value differences. [Inherent to the entropy method defined by Cernekova in section 3.]

Instant claim 66: As per the discussion of claim 50, the limitations of claim 66 have been taught by the cited prior art.

12.   Claims 61-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van Zon as applied to claims 38, 48, and 54 above, and further in view of Said (WO 03/010716).

Instant claim 61: A method according to claim 54, wherein determining a blockiness invisibility measure of the image comprises a method for determining a blockiness invisibility measure of an

image, comprising: [As per the discussion of claims 38 and 48, Van Zon has taught the determination of various image quality metrics of a sequence of image data (video images) including motion and blockiness of the image in order to determine an overall measure of the image quality, but Van Zon has not specified the methods of determining the blockiness measurement. However, Said has taught an entropy based (paragraphs 0015-0030) method of analyzing image blocks for compression to determine whether the edge regions are smooth or edge containing in order to reduced the visibility of artifacts in the compressed image date (blockiness and ringing were known in the art to be artifacts caused by compressing edge and smooth regions). Thus both Van Zon and Said have taught the determination of at least one image quality metric related to the visibility of blockiness in an image. It would have been obvious to one of ordinary skill in the art to substitute a known method of measuring an image quality metric such as the visibility of blockiness artifacts as taught by Said into the method of measuring and combining multiple image quality metrics (including blockiness) as taught by Van Zon to perform the predictable result of measuring image quality (as taught by Van Zon) using a plurality of image characteristics (such as blockiness)]

averaging differences in colour values at block boundaries within the image; [Described as part of the entropy method defined by Said.]

averaging differences in colour values between adjacent pixels; and [Described as part of the entropy method defined by Said.]

providing the blockiness invisibility measure based on a relative strength of the averaged differences in colour values at block boundaries within the image with respect to the averaged

differences in colour values between adjacent pixels. [Described as part of the entropy method

defined by Said.]

Instant claim 62: As per the discussion of claim 61, the limitations of claim 62 have been taught

by the cited prior art.

Contact Information

13.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Nathan Bloom whose telephone number is 571-272-9321. The

examiner can normally be reached on Monday through Friday from 10:00 am to 6:30 pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vu

Le, can be reached on 571-272-7332. The fax phone number for the organization where this

application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application

Information Retrieval (PAIR) system. Status information for published applications may be

obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

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system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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